

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
8 February 2001 (08.02.2001)

PCT

(10) International Publication Number  
**WO 01/09664 A1**

(51) International Patent Classification<sup>7</sup>: G02B 27/22, H04N 13/00, G09F 19/12

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(21) International Application Number: PCT/NZ00/00143

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(22) International Filing Date: 1 August 2000 (01.08.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
336212 1 August 1999 (01.08.1999) NZ

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

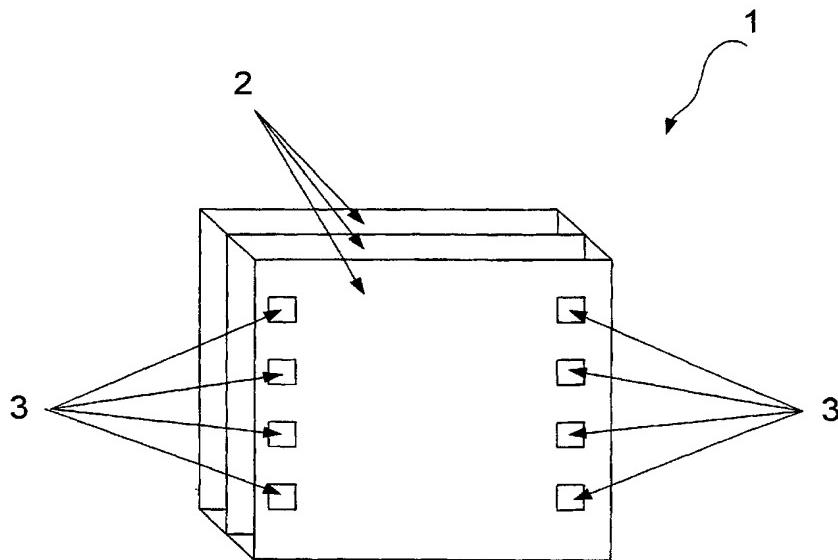
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Published:

— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: INTERACTIVE THREE DIMENSIONAL DISPLAY WITH LAYERED SCREENS



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(57) Abstract: An interactive imaging system (1) with a perception of depth includes at least two screens (2) configured to show a three dimensional image, where the user can manipulate the image via control means (3). The control means (3) can comprise touch screen controls, or means adjacent to the screens such as buttons, touchpads or a joystick. Image information may be transmitted over the Internet or other communication means. Applications include computer games and simulators. Advertising messages may be displayed on one screen while images are being displayed on other screens.

**INTERACTIVE THREE DIMENSIONAL DISPLAY WITH LAYERED SCREENS****TECHNICAL FIELD**

This invention relates to an improved method of displaying images and in particular to producing images with depth.

**5    BACKGROUND ART**

Since our eyes naturally perceive depth, it is seen as a disadvantage that most display systems are two dimensional. Furthermore, there are many applications of displays where the realism of depth would improve the effectiveness of the display. Thus many attempts have been made to create display systems with depth.

10    A number of display systems that present an image of depth have been developed. One class of such displays requires the viewer to wear some form of eye shield system by which various means allows the viewer's two eyes to see different images that are concurrently displayed on the same two dimensional screen. However, many users find it unsatisfactory to wear eye shields, while the method of providing two different 15    images on the same screen is cumbersome and inconvenient for many applications.

A related but different class of displays presents a different image to each eye by means of a binocular image system in close proximity to both eyes. This method, however, is restricted in the number of viewers who can use the system and again many users find it unsatisfactory and uncomfortable to use.

20    A third class of display uses modifications of the two dimensional screen surface wherein two images are created on the screen, but by manipulation of multiple

refractors on the screen, for a viewer in the correct position one image is refracted into the right eye, and the other image is refracted into the left eye.

This system requires the users to be carefully placed, is inflexible and has not found favour with many users.

- 5      The major problems with these systems were overcome by the innovative screen techniques disclosed in PCT Patent Application No's. PCT/NZ98/00098 and PCT/NZ99/00021 which detail a screen system producing a perception of depth comprising at least two screens placed such that their axes are approximately co-linear, with each screen separated from the other in the direction of the normal,
- 10     wherein an image, or part of an image, displayed on one or more screens can be selectively made transparent, opaque or partially opaque as desired.

It has been found however that even with these types of screens there are some applications where the operator needs more control of the images, such as with computer games and other interactive programs – for example training programs.

- 15     It is an object of the present invention to address the foregoing problems or at least to provide the public with a useful choice.

Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

#### **DISCLOSURE OF INVENTION**

- 20    According to one aspect of the present invention there is provided an interactive imaging system with depth, including

at least two screens configured to show a 3-dimensional image

characterised in that

a user can manipulate one or more parts of an image displayed, by the means of using one or more on-screen touch control means.

- 5 It should be understood that in preferred embodiments of the present invention the 3 dimensional composite image, spread over two or more screens, can be interactive with any sort of controls, in particular with "touch" controls on a screen or on a clear panel in front of the front screen.

- It should be further understood that in preferred embodiments the "touch" control can  
10 be activated by a variety of items including, but not limited to, pointers, pens, fingers or pencils.

- One form of touch control means can be an image of a "button" on the front and/or rear screens which when touched can flip between 2 or more screens to show the information relating to the button, or can perform an operation associated with that  
15 button.

According to another aspect of the present invention there is provided an interactive imaging system with depth, including

at least two screens configured to show a 3-dimensional image

characterised in that

- 20 at least one part of the image, displayed on one or more of the screens, can be manipulated by the actions of the user by using one or more control means.

In preferred embodiments of the present invention a user can manipulate one or more parts of an image by using one or more control means located on or near the screens, these control means can be in the form of a standard “keypress” button or a type of joystick control or may even be “touch” controls located on at least one touchpad adjacent to the screen, any of which can be readily purchased “off the shelf”.

It would be clear to anyone skilled in the art that these are all “off the shelf” items that are readily available.

According to a further aspect of the present invention there is provided an interactive imaging system which creates a perception of depth, including

- 10 at least two screens configured to show a 3-dimensional image

characterised in that

at least one part of the image, displayed on one or more of the screens, can be manipulated by the actions of the user by using one or more control means, and

the information necessary to generate at least part of an image can be transmitted from  
15 or received by the display apparatus via the internet or by another suitable communications means.

In preferred embodiments of the present invention there is provided a method of controlling at least part of an image displayed on an interactive imaging system which creates a perception of depth including

- 20 at least two screens configured to show a 3-dimensional image

characterised by the step of

manipulating, by the actions of the user, at least one or more parts of an image displayed on the interactive imaging system.

In some preferred embodiments of the present invention there is provided a method of controlling at least part of an image displayed on an interactive imaging system which

5 creates a perception of depth including

at least two screens configured to show a 3-dimensional image

characterised by the step of

sending or receiving the information necessary to generate the image on the interactive imaging system via the internet or any other suitable communication

10 means.

In preferred embodiments of the present invention the images, or the data corresponding to the images, may be transmitted over the Internet or by other communication means for display at any compatible display unit, or in the absence of a suitable display unit, as one or more separate images simultaneously on a single screen display. The data corresponding to the images may be stored at any compatible remote location for processing or display.

Therefore the present invention has huge advantages over the display systems currently available as a far greater amount of data can be displayed on the display system.

20 Generally, data for front and rear images can be obtained and stored separately. Applications where this is appropriate can be in kiosks, games, simulators, training

devices and the like.

For example, a flight simulator in its simplest form may consist of two screens wherein the front screen may display the cockpit instruments, control settings and generally illustrate the interior of the cockpit, while the rear screen shows the image  
5 as seen through the cockpit windscreen - such as other aircraft, sky, cloud, grounds, the runway and so on, therefore giving the operator a sense of true perspective as different manoeuvres are simulated.

Either conventional instrument displays or "head-up" displays can be simulated with this invention, with the "touch-screen" ability improving the "playability" of these  
10 applications.

Display kiosks in stores and also for other applications can be configured to show images of products, their use and typically pictorial data for describing, promoting and benefiting from the product on the rear screen, while written or symbolic information about the product can be shown on the front screen.

15 Alternatively, this order may be reversed, combined or arranged as appropriate for the preferred method of presentation.

The front screen may also have interactive functions such as touch controls, selectors and the like which allow the viewer to select or control either or all of the display screens.

20 Alternatively the controls may be separate from, but in close proximity to, the screen and still allow the user to manipulate or select separately or simultaneously what is displayed on each screen.

Kiosks based on the invention may be used for a variety of advertising and information presentation purposes. For example, a customer may be attracted to the kiosk by the use of attractive 3 dimensional images which can then show advertising in an attractive and unobtrusive manner principally on one screen while other screens at different depths continue to keep the viewers attention. The viewer may be encouraged to concentrate on action occurring on one screen while advertising or other messages are unobtrusively shown on parts of another screen, typically the front screen, which may be mostly transparent.

This has a significant advantage over prior systems in that far more information can be displayed at any one time, for instance on a two screen system – twice the information is available to the operator than on a single screen system.

The use of kiosks based on the invention allows the dissemination of more advertising within the same footprint or floor area, while also enabling the advertising to be made less obtrusive and more acceptable to customers, allowing the advertising to be more effective.

In effect the available screen size within the same footprint or floor area is expanded allowing more information to be displayed and in a form where it becomes easier to be absorbed.

One huge advantage with the present invention over the systems previously available is that due to having either on-screen touch controls, or controls located adjacent to the screen system, the operator does not need to take their gaze away from the screen area in order to perform a control function.

This not only means that their concentration is not broken but also that they will be able to cope with a higher information rate.

There are a number of applications which are ideally suited to this aspect, in particular computer gaming where taking your eyes from the screen can affect your performance

5 in an extremely adverse manner.

The use of the present invention means that a computer gamer for instance will have a much faster response time to any given situation and less likelihood of missing any on-screen event.

This has even further advantages when the image or images are transferred over the

10 internet as the advantages disclosed previously can be applied to on-line applications.

#### **BRIEF DESCRIPTION OF DRAWINGS**

Further aspects of the present invention will become apparent from the following description which is given by way of example only and with reference to the accompanying drawings in which:

15 Figure 1 This is a perspective representation of one preferred embodiment of the present invention; and

Figure 2 This is a perspective representation of another preferred embodiment of the present invention.

#### **BEST MODES FOR CARRYING OUT THE INVENTION**

20 With reference to Figure 1 there is illustrated an interactive imaging system with a perception of depth generally indicated by arrow 1.

The interactive imaging system 1 is comprised of a number of parallel screens 2 configured in order they give a perception of depth.

An image, or part of an image, contained on one or more of the screens 2 can be manipulated by use of the on-screen touch controls 3.

- 5 It should be appreciated that the on-screen touch controls are of a known off-the-shelf type.

The on-screen touch controls 3 can be configured to perform a variety of functions including the switching of the screens to the foreground and the manipulation of part of an image from one screen to another.

- 10 It is envisaged that in some preferred modes of operation the interactive imaging system 1 will display three dimensional images on the screens 2 that have been transmitted to the interactive imaging system 1 via the internet.

- With reference to figure 2 there is shown an interactive imaging system with a perception of depth where an image, or part of an image, contained on one or more of  
15 the screens 2 can be manipulated by use of controls at the side of the screen which work in the same manner as those in figure 1.

It should also be appreciated that these can be replaced by other controls such as an off-the-shelf type joystick.

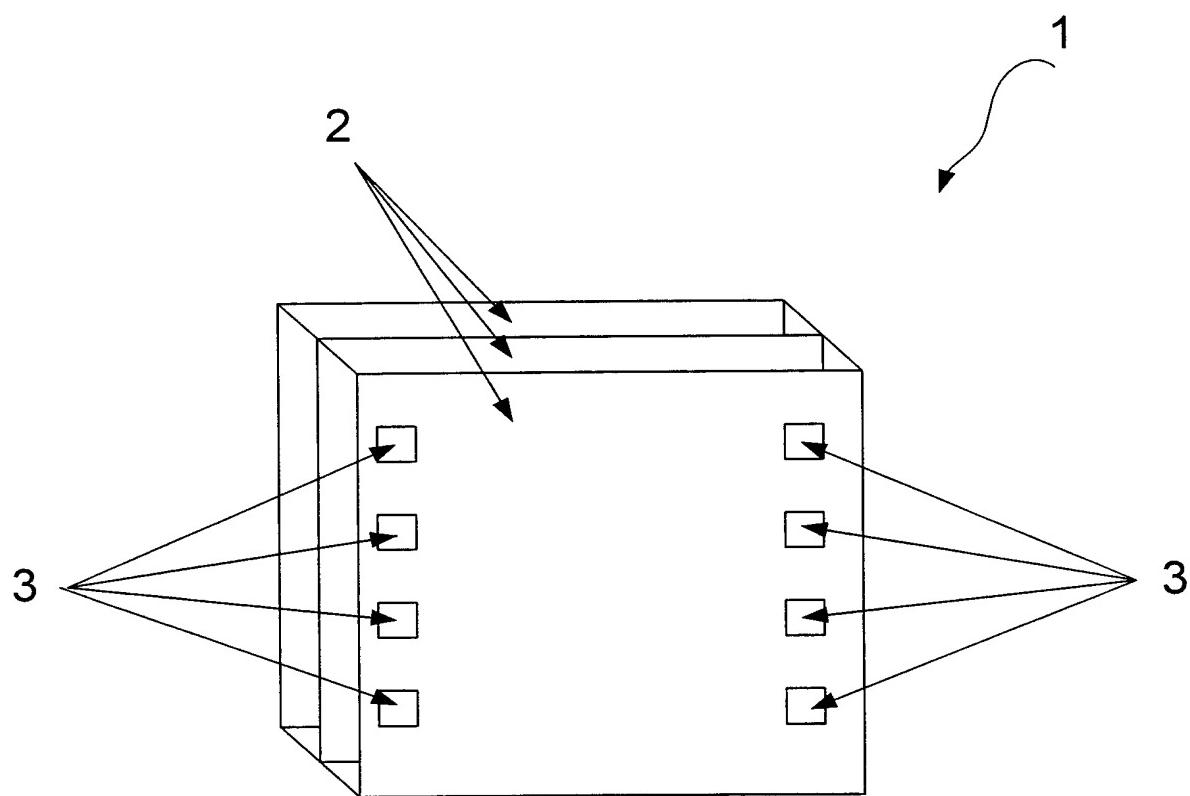
- Aspects of the present invention have been described by way of example only and it  
20 should be appreciated that modifications and additions may be made thereto without departing from the scope thereof.

**WHAT WE CLAIM IS;**

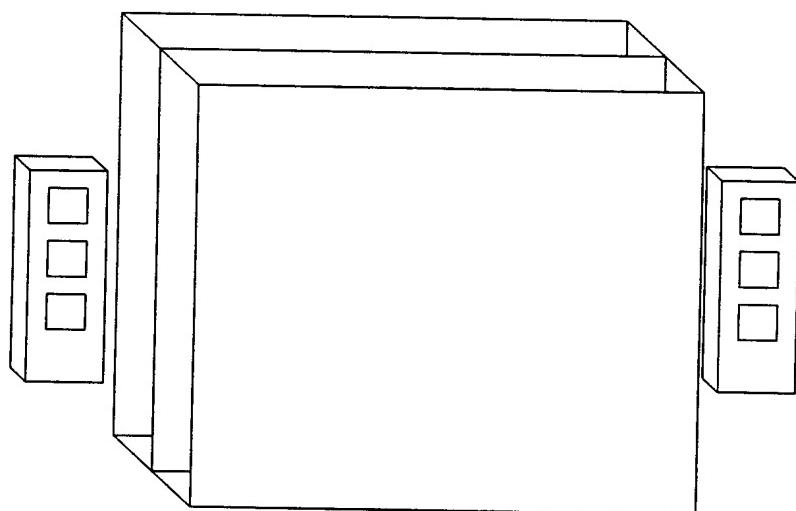
1. An interactive imaging system with a perception of depth including at least two screens configured to show a three dimensional image characterised in that a user can manipulate one or more parts of an image by using one or more on-screen touch control means.
2. An interactive imaging system as claimed in claim one wherein the touch control means are on a screen or on a clear panel in front of the front screen.
3. An interactive imaging system with a perception of depth, including at least two screens configured to show a three dimensional image characterised in that a user can manipulate one or more parts of an image by using one or more control means, wherein the controls are located adjacent to the screens and are in the form of a keypress button, a type of joystick or a touch control located on at least one touchpad.
4. An interactive imaging system which creates a perception of depth, including at least two screens configured to show a three dimensional image characterised in that at least one part of the image displayed on one or more of the screens can be manipulated by the actions of the user, and the information necessary to generate at least part of an image can be transmitted or received by the display apparatus via the internet or by another suitable communication means.

5. An interactive imaging system as claimed in claim 4 wherein the information transmitted over the internet or any other suitable communication means can be stored at any compatible remote location for processing or displaying.
6. An interactive imaging system as claimed in claim 5 wherein the display is located within a kiosk or booth.
7. A method of controlling at least part of an image displayed on an interactive imaging system which creates a perception of depth, including at least two screens configured to show a three dimensional image characterised by the step of manipulating by the actions of the user at least one or more parts of an image displayed on the interactive imaging system.
8. A method of controlling at least part of an image displayed on an interactive imaging system which creates a perception of depth including at least two screens configured to show a three dimensional image characterised by the step of sending or receiving the information necessary to generate the image on the interactive imaging system via the internet or any other suitable communication means.

## FIG 1



# FIG 2



## INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ00/00143

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
Int. Cl. <sup>7</sup> : G02B 27/22, H04N 13/00, G09F 19/12		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) IPC: G02B, G09F 13/-, 19/-, H04N 13/-, 15/-		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DWPI, JAPIO		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4472737 A (IWASAKI) 18 September 1984 Columns 2-4, Figures 1-3	3-5, 7-8
X	US 4649425 A (PUND) 10 March 1987 Columns 3-8, 10, Figures 1-8	3-8
X	EP 454423 A (TFE HONG KONG LIMITED) 30 October 1991 Columns 1-3, Figures 1-2	3, 7
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>		
Date of the actual completion of the international search <b>10 October 2000</b>	Date of mailing of the international search report <b>17 OCT 2000</b>	
Name and mailing address of the ISA/AU  AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer  <b>MICHAEL HALL</b> Telephone No : (02) 6283 2474	

**INTERNATIONAL SEARCH REPORT**

International application No.

**PCT/NZ00/00143**

<b>C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
<b>Category*</b>	<b>Citation of document, with indication, where appropriate, of the relevant passages</b>	<b>Relevant to claim No.</b>
X	Derwent Abstract Accession No. 97-169536/16 JP 09-033858, Class W02 W03, JP 09-33858 A (NITTETSU ELES CO LTD) 27 February 1997 Abstract	3-5, 7-8
X	GB 2312584 A (HE HOLDINGS INC. DBA HUGHES ELECTRONICS) 29 October 1997. Pages 1, 2-6, 8, Figures 1, 4	3-5, 7-8
P, X	DE 29912074 (FRANZ) 30 December 1999 Pages 1-2, Figure 1	3-5, 7-8

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
**PCT/NZ00/00143**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
US	4649425	DE	3427260	FR	2549972	GB	2145897
		JP	60051392				
EP	454423	GB	2245092				
GB	2312584	BE	1011678	JP	10039782	NL	1005868
		US	5813742				
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